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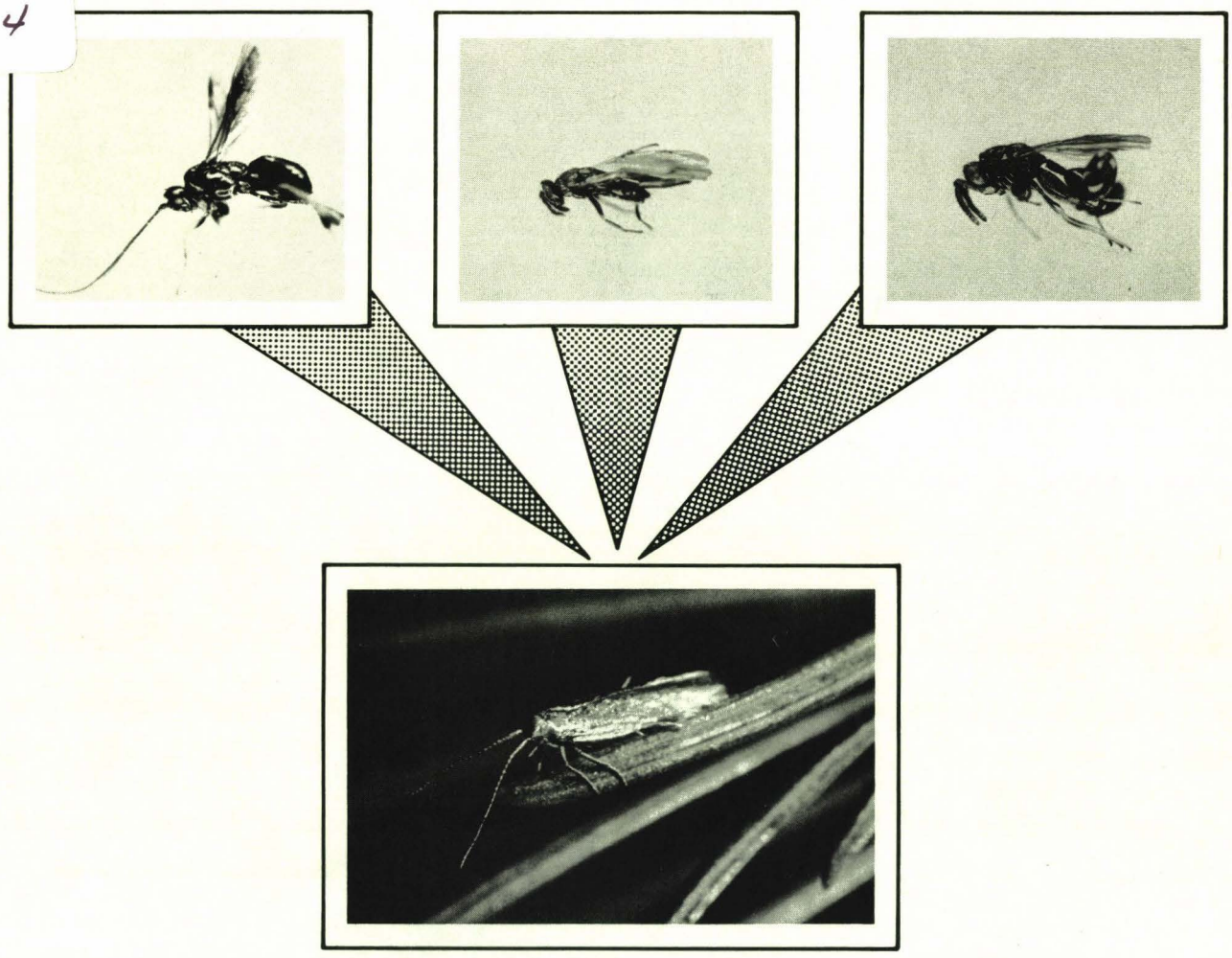

Impact of Parasites on the Larch Casebearer in the Northern Region

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IMPACT OF PARASITES ON THE LARCH CASEBEARER IN THE NORTHERN REGION - 1970

by

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ABSTRACT

An evaluation of the parasite complex of the larch casebearer in Idaho, Montana, and eastern Washington is reported here. From 95 scattered collection stations Spilochalcis albifrons (Walsh), Dicladocerus sp. near westwoodi, and Agathis pumila (Ratz), the introduced parasite, were the three most abundant species recovered. A. pumila was recovered from 58 percent of the release sites sampled in 1970 and at four locations other than release sites.

INTRODUCTION

The larch casebearer, Coleophora laricella Hbn., was discovered in Idaho in 1957 and has since spread to over 80 percent of the western larch type. Severe and persistent defoliation has contributed to tree mortality and growth reduction.1/

Following the casebearer discovery, we initiated an extensive release program of Agathis pumila, a successful parasite of the casebearer in the northeastern United States and Canada. Rearings from a few scattered release sites in 1968 and 1969, to evaluate the success of A. pumila, revealed that native parasites were quite abundant at several locations.

Early reports of parasitism of the casebearer in Idaho indicated that three species of Hymenopterous parasites were present at low levels. Parasitism at Rocky Point, Idaho, was 4.5 percent in 1958, but dropped to less than 1.0 percent by 1959. Almost all of the parasitism was by Spilochalcis albifrons. Three specimens of Bracon pygmaeus and one of Pristomerus sp. were the only other parasites recovered.2/

1/ Tunnock, Scott, R.E. Denton, C.E. Carlson, and W.W. Janssen. Larch casebearer and other factors involved with deterioration of western larch stands in northern Idaho. Intermountain For. and Range Exp. Sta., Ogden, Utah, Research Paper INT-68, 1969.

2/ Denton, R.E. The larch casebearer in western forests. Northern Rocky Mtn. Region, Div. Forest Insect Research, Intermountain For. and Range Exp. Sta., Ogden, Utah, 1964.

Parasites of the larch casebearer in British Columbia were investigated in 1967 and 1968, and parasitism had reached a maximum of 14 percent in one area by 1968. The following parasites were reared from larch casebearer collected near Creston and Salmo, British Columbia:[3/]

1. Bracon sp.
2. Scambus decorus (Walley)
3. Scambus transgressus (Holmgren)
4. Gelis tenellus (Say)
5. Dicladocerus westwoodii Westw.
6. Tetrastichus xanthops Ratz.
7. Amblymerus sp.
8. Sceptrothelys deione (Walker)
9. Spilochalcis albifrons (Walsh)

In the spring of 1970 an evaluation was initiated to determine the relative abundance and distribution of native parasites associated with the larch casebearer in Montana, Idaho, and eastern Washington.

METHODS

Ninety-five sampling stations were distributed over the Colville, Coeur d'Alene, Clearwater, Flathead, Kaniksu, Kootenai, Lolo, and St. Joe National Forests. Fifty-three of the collection points were locations of previous attempts to establish Agathis pumila. The remaining 42 areas were selected to obtain a satisfactory sampling distribution over the area surveyed (map-figure 1).

Three consecutive weekly collections of 100 casebearer pupae were taken from each area. Branch segments were removed from three or more trees per sampling station with pole pruners, placed in paper bags, and transferred to the laboratory where pupae were removed for rearing. Forest personnel assisted in the collection, making it possible to have the pupae in rearing the week they were collected.

A total of 100 individual casebearer pupa were removed from the branch segments from each sampling station. Either the entire spur or individual needle with a pupa attached was removed so as not to damage the pupa. Rearings were maintained in 4-dram medicine cups secured with rubber bands to 24- by 16- by 1/8-inch hardboard trays in a screened insectary at Missoula, Montana. (Figure 2) Daily emergence records were kept for both casebearer moths and parasites to obtain biological data for the various parasite species.

3/ Andrews, R.J. and N.J. Geistlinger. Parasites of the larch casebearer, Coleophora laricella Hbn., in British Columbia, Jour, Ent. Soc. of B.C. Aug. 1969.

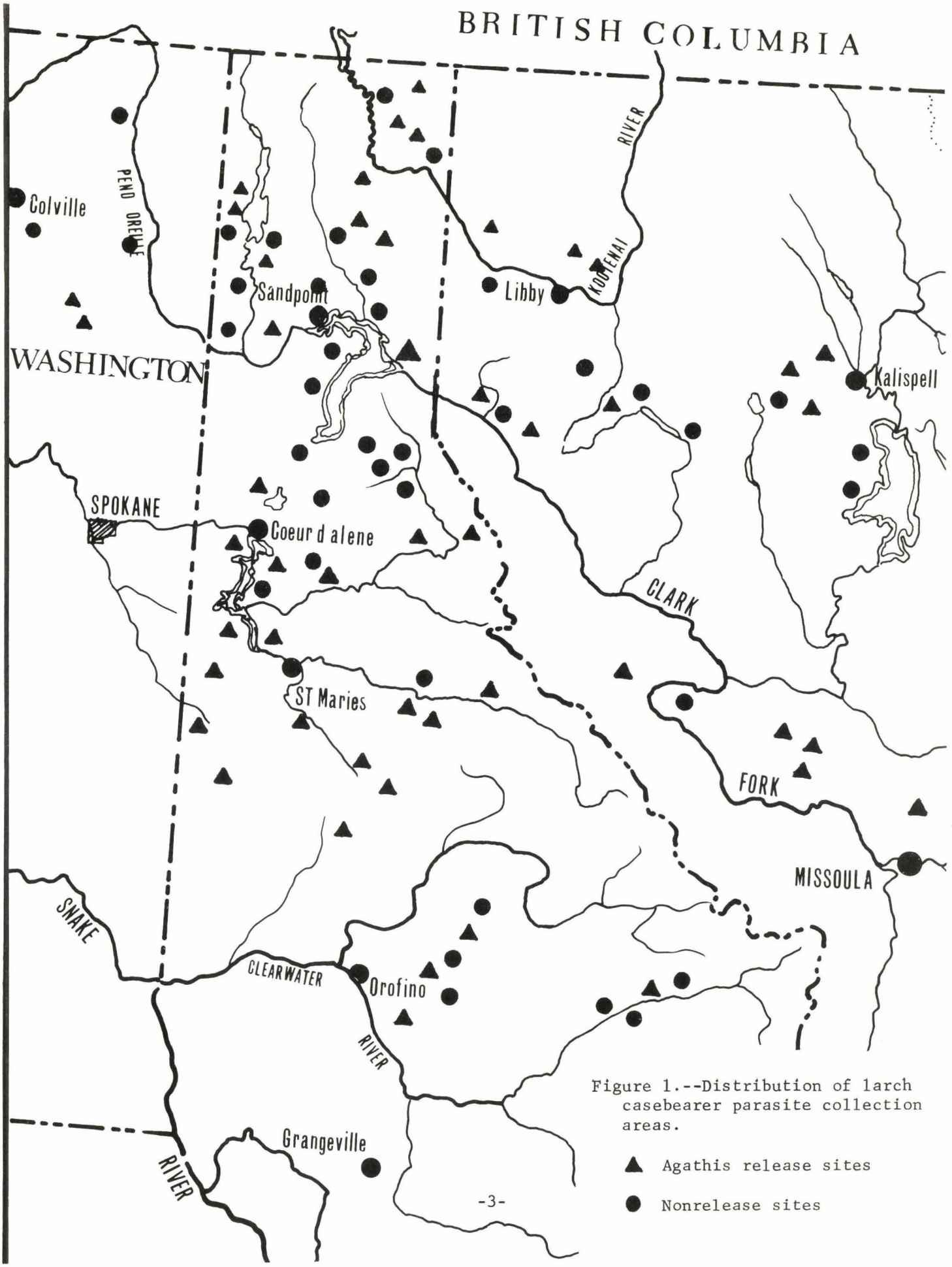

Figure 1.--Distribution of larch casebearer parasite collection areas.

▲ Agathis release sites

● Nonrelease sites

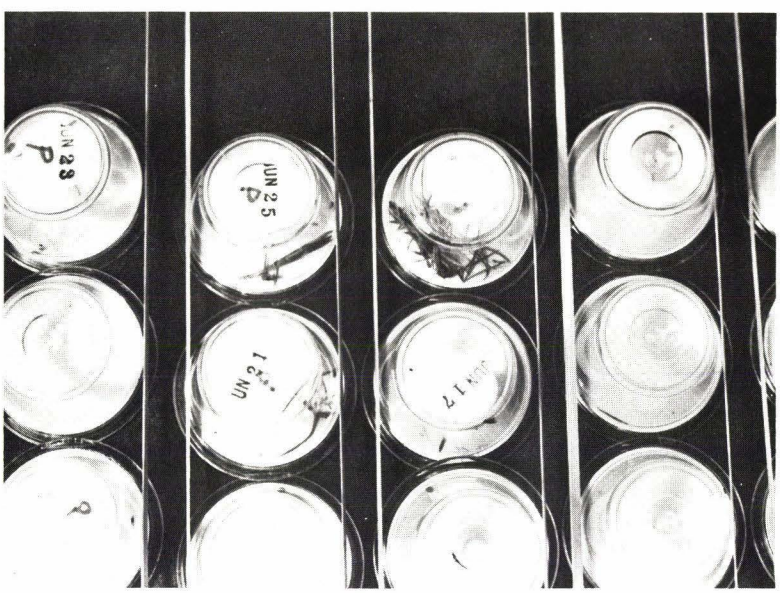

Figure 2. Rearing cups attached to hardboard trays.

RESULTS

Results of this evaluation show that two native Hymenopterous parasites, Spilochalcis albifrons (Walsh) Chalcididae and Dicladocerus sp. near westwoodi Eulophidae, were quite abundant throughout the Region (table 1). Parasitism by S. albifrons averaged 11.2 percent from 76 locations. Maximum parasitism by S. albifrons was 53 percent at the Hoyt Flats station on the St. Joe National Forest. Dicladocerus sp. was recovered from 74 locations with an average parasitism of 4.7 percent. Maximum percent parasitism of a collection of 100 larvae was 41 percent from the Waylet station on the Kootenai National Forest.

Agathis pumila, the introduced parasite, was recovered from 31 of 53 release sites sampled, and from four areas which were not release sites. Average parasitism by A. pumila at release sites was 10.3 percent, with a maximum of 68 percent of a collection taken from a 1960 release site on the St. Joe National Forest. Parasitism by A. pumila from the four areas which were not release sites averaged 0.3 percent. This evaluation has shown that A. pumila has been well established in some areas, but widespread dispersal in detectable quantities has not occurred.

Bracon pygmaeus was recovered from several areas, but parasitism never exceeded 5 percent of a collection. One unidentified Chalcid was recovered at several points and contributed 5 percent parasitism in a few collections. At the time of this writing, identifications of the other species recovered have not been received. None, however, have contributed significantly to the total parasitism of a collection.

An analysis of variance and t tests showed a significant difference between collection intervals for recovery of Spilochalcis albifrons and other species of parasites (table 2). There was no significant difference between sample collection dates for Agathis pumila or Dicladocerus sp.

Clearing host cases in KOH from which Spilochalcis albifrons emerged showed that the casebearer had reached the pupa stage. This concurs with Sloan and Coppel's[4/] findings in that S. albifrons was the only parasite to emerge from the host pupa case. Sloan also states that S. side (Walk.), a closely related species, emerges 20 to 25 days after egg deposit. This would account for the absence of parasitism by Spilochalcis in the first sample collections. Evidently, S. albifrons attacks the casebearer after it has reached the pupal stage. Since unidentified species of parasites were grouped together, it was

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4/ Sloan, Norman F. and Harry C. Coppel. The insect parasites of the larch casebearer, Coleophora laricella Hubner Lepidoptera Coleophoridae, in Wisconsin with keys to the adult and mature larval remains. Wisconsin Academy of Sciences, Arts and Letters, Col. 54, 1965.

not determined which one contributed to the significant difference in sample collection dates.

Many of the collections contained numerous unemerged cases. After emergence was completed, these cases from all 285 collections were soaked for 12 hours in a 10 percent KOH solution. The solution dissolved the case and silk, revealing the casebearer or parasite. Casebearer development at the time of death could then be readily determined. Casebearer mortality averaged 11.9 percent for all 285 collections; 6.1 percent died as larvae and 5.8 percent as pupae.

A disclosure was made during the time of KOH treatment which revealed the fate of many A. pumila. Although A. pumila was fully developed in most instances, only 41.6 percent managed to emerge under insectary rearing conditions. Low humidity in the cups probably hindered emergence of A. pumila, but apparently did not affect emergence of other species.

Emergence data obtained from 15 scattered collection sites showed that moth emergence started briskly, reaching a peak on the third day. Different areas were synchronized by using the beginning of moth emergence as day one (fig. 3). A. pumila emergence started on the 14th day and reached a peak on the 22nd day, or 19 days after peak moth emergence. Dicladocerus sp. began emerging during moth flight on the fifth day and increased until the 16th day, then began tapering off. S. albifrons reached a peak on the 20th day, and B. pygmaeus on the 12th day.

CONCLUSIONS

Data from the survey shows only three parasites to be numerous in this Region. Agathis pumila was recovered in 58 percent of the release sites and in four nonrelease sites, which indicated limited dispersal. A. pumila emergence was affected by rearing conditions, limiting it to 41.6 percent. Spilochalcis albifrons and Dicladocerus sp. were recovered throughout the Region. It was determined that Spilochalcis albifrons emerged from the host pupa case, whereas Agathis pumila and Dicladocerus sp. emerges from the consumed casebearer larva. Mortality of the casebearer in rearing cups averaged 11.9 percent.

FIG. 3 -- EMERGENCE DATA OF THE LARCH CASEBEARER AND ITS PARASITES

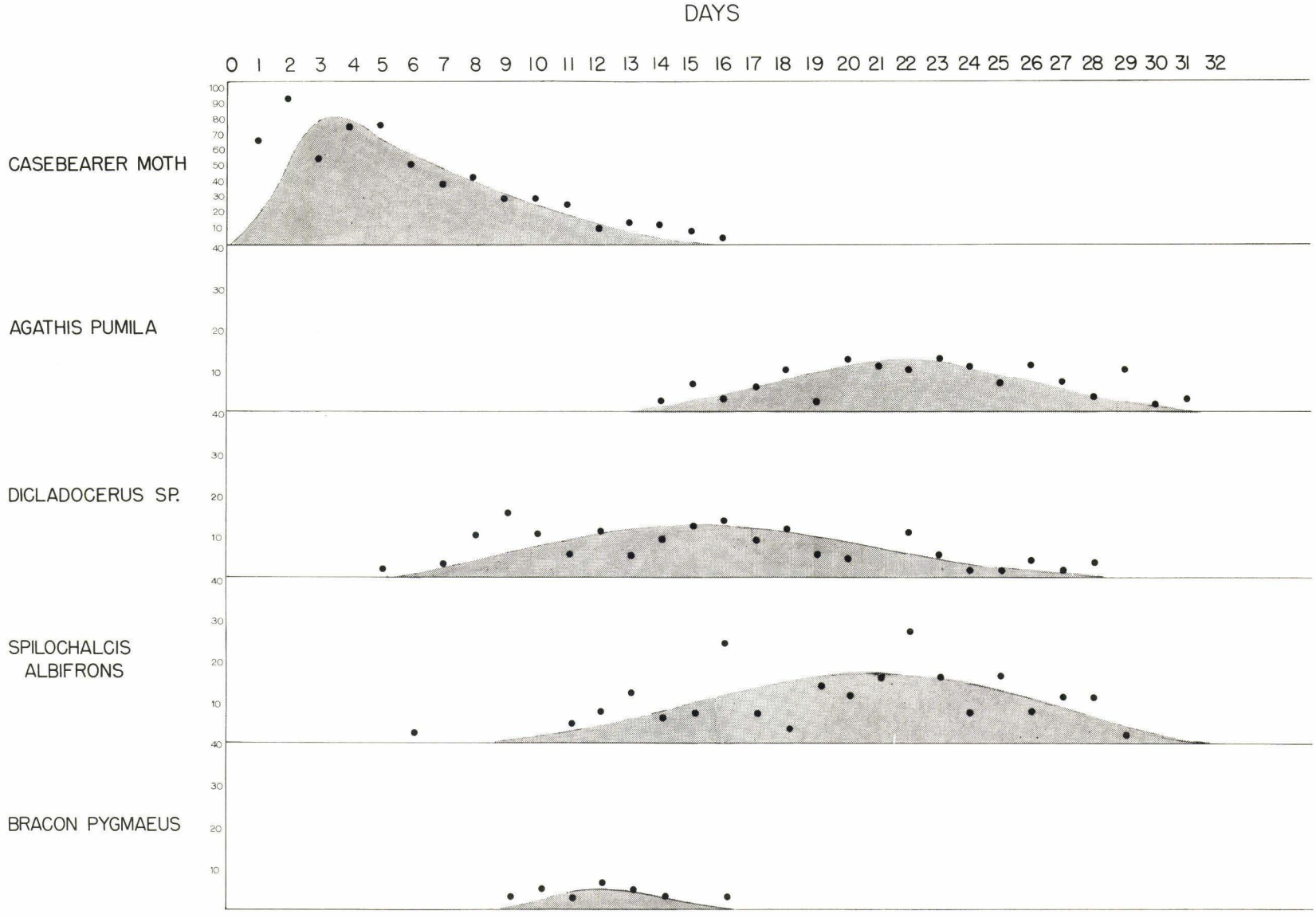
DAYS
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
CASEBEARER MOTH
AGATHIS PUMILA
DICLADOCERUS SP.
SPILOCHALCIS ALBIFRONS
BRACON PYGMAEUS

Table 1 --Percent parasitism by Agathis pumila and native parasites by Forest and sample station in 1970.

Area	Agathis[1/]	Dicladocerus[1/]	Spilochalcis[2/]	Other[2/]	Total
		CLEARWATER NF			
Colgate	0.0	3.3	33.0	2.0	38.3
Pack Bridge[3/]	5.0	0.0	46.0	3.0	54.0
Eagle Creek	0.0	0.0	38.0	13.0	51.0
Green Flat	0.0	0.0	52.0	1.0	53.0
Ford Creek[3/]	0.7	0.0	25.0	0.0	25.7
Theodore Forest[3/]	4.3	0.7	10.0	0.0	15.0
Brouns Creek	0.0	0.0	10.0	0.0	10.0
Snake Creek	0.0	0.0	3.0	0.0	3.0
Cardiff[3/]	3.3	0.0	2.0	0.0	5.3
Headquarters[3/]	0.3	0.0	3.0	0.0	3.3
Deer Creek	0.0	0.0	2.0	0.0	2.0

1/ Average of three collections.

2/ Data from last collection because of significant differences between collection dates.

3/ A. pumila release sites.

Table 1 --Percent parasitism by Agathis pumila and native parasites by Forest and sample station in 1970, con.

Area	Agathis[1/]	Dicladocerus[1/]	Spilochalcis[2/]	Other[2/]	Total
		COEUR D'ALENE NF			
Beauty Bay[3/]	4.3	0.3	7.0	1.0	12.6
Turner Bay	0.0	0.0	0.0	0.0	0.0
Shoshone[3/]	0.0	3.3	0.0	0.0	3.3
Cougar Gulch[3/]	0.7	0.7	2.0	0.0	3.4
Tent Creek[3/]	0.0	1.0	2.0	1.0	4.0
Fourth of July	0.0	0.3	21.0	1.0	22.3
Hayden Lake[3/]	0.0	0.3	11.0	0.0	11.3
Brett Creek	0.0	3.3	15.0	0.0	18.3
Rose Lake[3/]	4.0	1.7	22.0	0.0	27.7
Hudlow	0.0	9.7	15.0	0.0	24.7
Trail Creek	0.0	3.0	6.0	0.0	9.0
Potter Creek	0.0	18.7	1.0	0.0	19.7
Devils Elbow	0.0	10.0	19.0	1.0	30.0
		COLVILLE NF			
Jared	0.0	0.7	20.0	0.0	20.7
White Mud	0.0	1.3	18.0	0.0	19.3
Crystal Falls	0.0	1.7	0.0	0.0	1.7
Box Canyon	0.0	0.0	0.0	0.0	0.0
Cottonwood[3/]	0.0	6.3	12.0	2.0	20.3
Chewelah[3/]	0.0	28.3	3.0	6.0	37.3

Table 1--Percent parasitism by Agathis pumila and native parasites by Forest and sample station in 1970, con.

Area	Agathis[1/]	Dicladocerus[1/]	Spilochalcis[2/]	Other[2/]	Total
		FLATHEAD NF			
Somers	0.0	0.0	8.0	2.0	10.0
Sun Valley	0.0	1.0	5.0	0.0	6.0
Ashley Lake Junc.[3/]	0.0	0.3	0.0	1.0	1.3
Ashley Lake[3/]	0.0	5.0	0.0	0.0	5.0
Polson[3/]	0.0	1.3	13.0	1.0	15.3
Betovia School[3/]	0.0	0.0	27.0	0.0	27.0
Lakeside	0.0	0.3	2.0	1.0	3.3
		KANIKSU NF			
Brush Lake[3/]	0.7	0.7	0.0	0.0	1.4
Copeland	0.0	0.7	2.0	1.0	3.7
Addie[3/]	0.0	2.3	3.0	0.0	5.3
Meadow Creek[3/]	0.3	2.0	0.0	2.0	4.3
Moyie Springs	0.0	0.0	1.0	0.0	1.0
W. Bonners Ferry[3/]	0.0	2.0	0.0	0.0	2.0
Ruby Creek	0.0	1.3	1.0	0.0	2.3
Deep Creek[3/]	13.3	0.0	17.0	1.0	31.3
Trail Creek[3/]	1.0	0.7	3.0	0.0	4.7
Hope[3/]	40.3	1.3	0.0	1.0	42.6
Colburn[4/]	0.3	0.3	0.0	0.0	0.6

4/ A. pumila recorded from nonrelease sites.

Table 1.--Percent parasitism by Agathis pumila and native parasites by Forest and sample station in 1970, con.

Area	Agathis[1/]	Dicladocerus[1/]	Spilochalcis[2/]	Other[2/]	Total
		KANIKSU NF, con.			
Gold Creek	0.0	0.0	0.0	0.0	0.0
Oden[3/]	31.7	0.3	2.0	0.0	34.0
Trestle Creek	0.0	0.3	3.0	0.0	3.3
Garfield Bay[4/]	0.3	0.3	1.0	2.0	3.6
Blacktail	0.0	1.3	2.0	0.0	3.3
Bayview[4/]	0.3	0.7	5.0	0.0	6.0
Nordman[3/]	1.0	2.7	0.0	0.0	3.7
Priest Lake	0.0	0.7	3.0	0.0	3.7
Coolin	0.0	6.7	0.0	1.0	7.7
Upper W. Branch	0.0	2.0	1.0	0.0	3.0
Gleason[3/]	1.0	1.3	6.0	0.0	8.3
Experiment Forest[3/]	0.0	1.0	1.0	0.0	2.0
Falls	0.0	0.0	8.0	0.0	8.0
Blue Lake[3/]	6.3	1.0	1.0	0.0	8.3
Reeder[3/]	0.0	1.0	7.0	0.0	8.0
Bull River Road[3/]	34.7	9.7	4.0	1.0	49.4
Bull River Camp	0.0	3.7	3.0	0.0	6.7
Rock Creek[3/]	20.3	20.3	2.0	8.0	50.6

Table 1.--Percent parasitism by Agathis pumila and native parasites by Forest and sample station in 1970, con.

Area	Agathis[1/]	Dicladocerus[1/]	Spilochalcis[2/]	Other[2/]	Total
		KOOTENAI NF			
Lake Creek	0.0	1.0	0.0	1.0	2.0
Troy[3/]	0.3	0.0	13.0	0.0	13.3
Rainy Creek[3/]	30.0	0.0	8.0	2.0	40.0
Waylet[3/]	5.3	30.0	11.0	0.0	46.3
Doak Creek[3/]	0.3	0.3	19.0	1.0	20.6
Libby Creek[4/]	0.3	22.0	0.0	0.0	22.3
Loon Lake	0.0	22.0	6.0	0.0	28.0
Thompson Lakes	0.0	11.7	29.0	4.0	44.7
		LOLO NF			
Cascade	0.0	14.0	13.0	4.0	31.0
Tamarack	0.0	5.7	4.0	0.0	9.7
Drexel[3/]	0.7	3.0	50.0	0.0	53.7
Camp Creek[3/]	0.3	6.3	11.0	1.0	18.6
Blue Creek[3/]	0.0	7.0	1.0	0.0	8.0
Josephine Creek[3/]	0.0	5.7	8.0	1.0	14.7
Evaro[3/]	0.7	0.7	16.0	0.0	17.4
Randolph Creek	0.0	26.5	0.0	2.0	28.5
		ST. JOE NF			
Indian Mountain[3/]	63.0	1.3	14.0	2.0	80.3
Boville[3/]	0.0	0.0	12.0	1.0	13.0
Elk Creek	0.0	0.3	17.0	0.0	17.3

Table 1.--Percent parasitism by Agathis pumila and native parasites by Forest and sample station in 1970, con.

Area	Agathis[1/]	Dicladocerus[1/]	Spilochalcis[2/]	Other[2/]	Total
		ST. JOE NF, con.			
Clarkia[3/]	5.6	0.7	6.0	0.7	13.0
Marble Creek[3/]	0.0	4.0	3.7	0.0	7.7
Vista Point[3/]	0.0	3.0	0.0	0.0	3.0
Plummer[3/]	0.0	0.3	7.0	0.0	7.3
Tensed[3/]	0.3	0.3	1.0	0.0	1.6
Hayburn[3/]	41.7	0.0	0.0	0.0	41.7
Mica Creek[3/]	0.0	2.0	7.0	0.0	9.0
Hoyte[3/]	0.0	1.7	53.0	0.0	54.7
Fernwood[3/]	0.0	6.7	6.0	0.0	12.7
Thorn Creek[3/]	0.3	2.3	9.0	0.0	11.6

Table 2.--Total number of parasites recovered by species and collection sequence

Species	Collection sequence		
	First	Second	Third
Agathis pumila	344	364	295
Dicladocerus sp.	247	319	294
Spilochalcis albifrons	96	411	821
Other species	23	34	72

Numbers with connecting lines significantly different at 0.05 percent level.